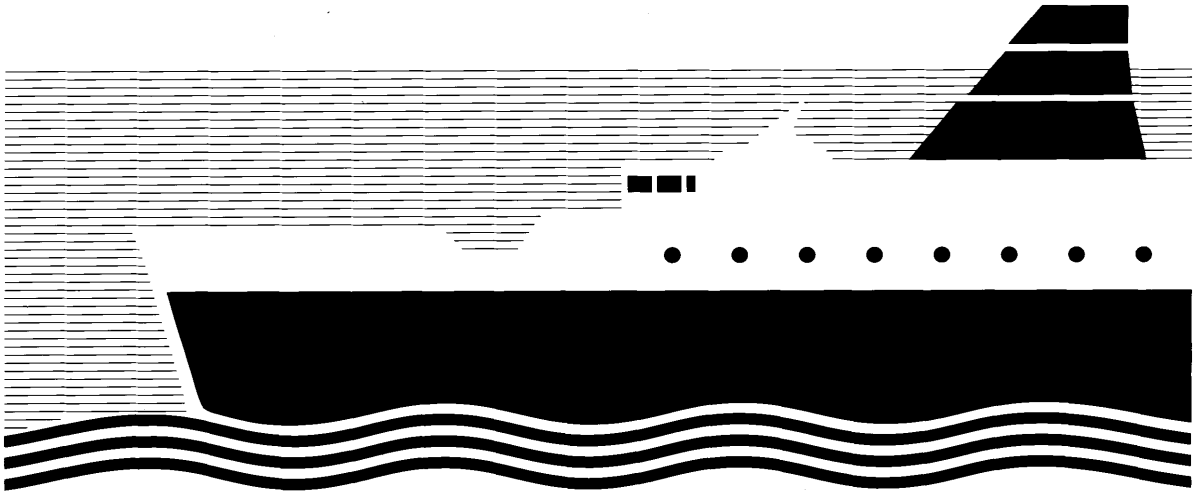
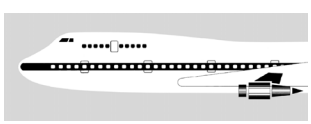
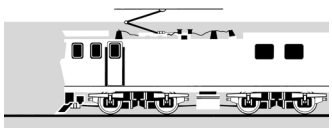


MARINE OCCURRENCE REPORT

03-209 **container vessel *Bunga Teratai 4* and fishing vessel *Mako*, collision, Tasman Bay** **4 July 2003**


TRANSPORT ACCIDENT INVESTIGATION COMMISSION
NEW ZEALAND

The Transport Accident Investigation Commission is an independent Crown entity established to determine the circumstances and causes of accidents and incidents with a view to avoiding similar occurrences in the future. Accordingly it is inappropriate that reports should be used to assign fault or blame or determine liability, since neither the investigation nor the reporting process has been undertaken for that purpose.

The Commission may make recommendations to improve transport safety. The cost of implementing any recommendation must always be balanced against its benefits. Such analysis is a matter for the regulator and the industry.

Report 03-209

container ship *Bunga Teratai 4*

and

fishing vessel *Mako*

collision

Tasman Bay

4 July 2003

Abstract

On Friday 4 July, at 0632 the container ship *Bunga Teratai 4* and the fishing vessel *Mako* collided in Tasman Bay to the west of D'Urville Island. Neither vessel was damaged to the extent that its seaworthiness was compromised. Had the point of contact been at the bow of the ship instead of the stern, the fishing vessel would probably have been capsized and sunk with the likelihood of serious injury or death of its 4 crew.

Safety issues identified included:

- adequacy of the lookout by the crew of the fishing vessel
- insufficiently positive action to avoid a collision by the crew of the container ship
- the standard of bridge resource management and poor maintenance of a safe navigational watch on the container ship
- possible fatigue of the fishing vessel skipper.

Safety recommendations were made to the Chief Executive Officer of McDonald and Brown Limited and the Chief Executive Officer of Malaysia International Shipping Corporation to address these issues.

The *Mako*

The *Bunga Teratai 4*

Contents

Figures

Abbreviations

ARPA	Automatic Radar Plotting Aid
Colregs	International Regulations for Preventing Collisions at Sea, 1972. New Zealand has given effect to these regulations by enacting Maritime Rules, Part 22[1].
GPS	global positioning system
GRP	glass reinforced plastic
kW	kilo Watt(s)
MCR	Maximum Continuous Rating
nm	nautical mile
STCW95	International Convention on Standards of Training, Certification and Watchkeeping of Seafarers 1978, as amended in 1995
TEU	twenty-foot equivalent unit
VHF	very high frequency

Glossary

ARPA	automated system to plot and monitor targets on a radar. Used by a watchkeeper to assist in collision prevention
note protest	a declaration before a Notary Public describing an event which has or might in the future result in damage to a ship, its cargo, or crew.
not under command	means a vessel which through some exceptional circumstance is unable to manoeuvre as required by the Maritime Rules, Part 22 and is therefore unable to keep out of the way of another vessel
paravane	(in this instance) a device towed off an extended arm at right angles to the fore and aft line, on each side of a vessel, to help reduce the rolling of the vessel in a seaway
shoot(ing)	the act of deploying a fishing net
TEU	an industry standard unit to express the relative number of containers based on an equivalent length, based on 20 foot dry-cargo containers, for example a 40-foot container = 2 TEU

[1] For the purpose of this report reference is made to paragraphs in Part 22. These are similarly numbered to the individual rules in the Colregs, for example Part 22.5, is equivalent to Colregs Rule 5, Look-out.

Data Summary

Vessel Particulars:

Name:	*Bunga Teratai 4*	*Mako*
Type:	container	fishing
Length:	184.00 m	23.24 m
Breadth:	27.40 m	
Gross Registered Tonnage:	21 339	99.82
Classification/safe ship management	Lloyds Register of Shipping	Survey Nelson Safe Ship Management
Owner/operator:	Malaysia International Shipping Corporation	McDonald Brown Ltd
Crew:	30	4
Port of Registry:	Port Klang	Nelson

Date and time:	4 July 2003 at 0632[2]	
Location:	Tasman Bay	
Injuries:	nil	nil
Damage:	paintwork scratched	anchor fairlead displaced and bow set in. Paravane arm severely bent and damage to superstructure in way of the wheelhouse
Investigator-in-charge	Captain Doug Monks	

[2] All times in this report are New Zealand Standard Time (UTC +12 hours) and are expressed in the 24-hour mode.

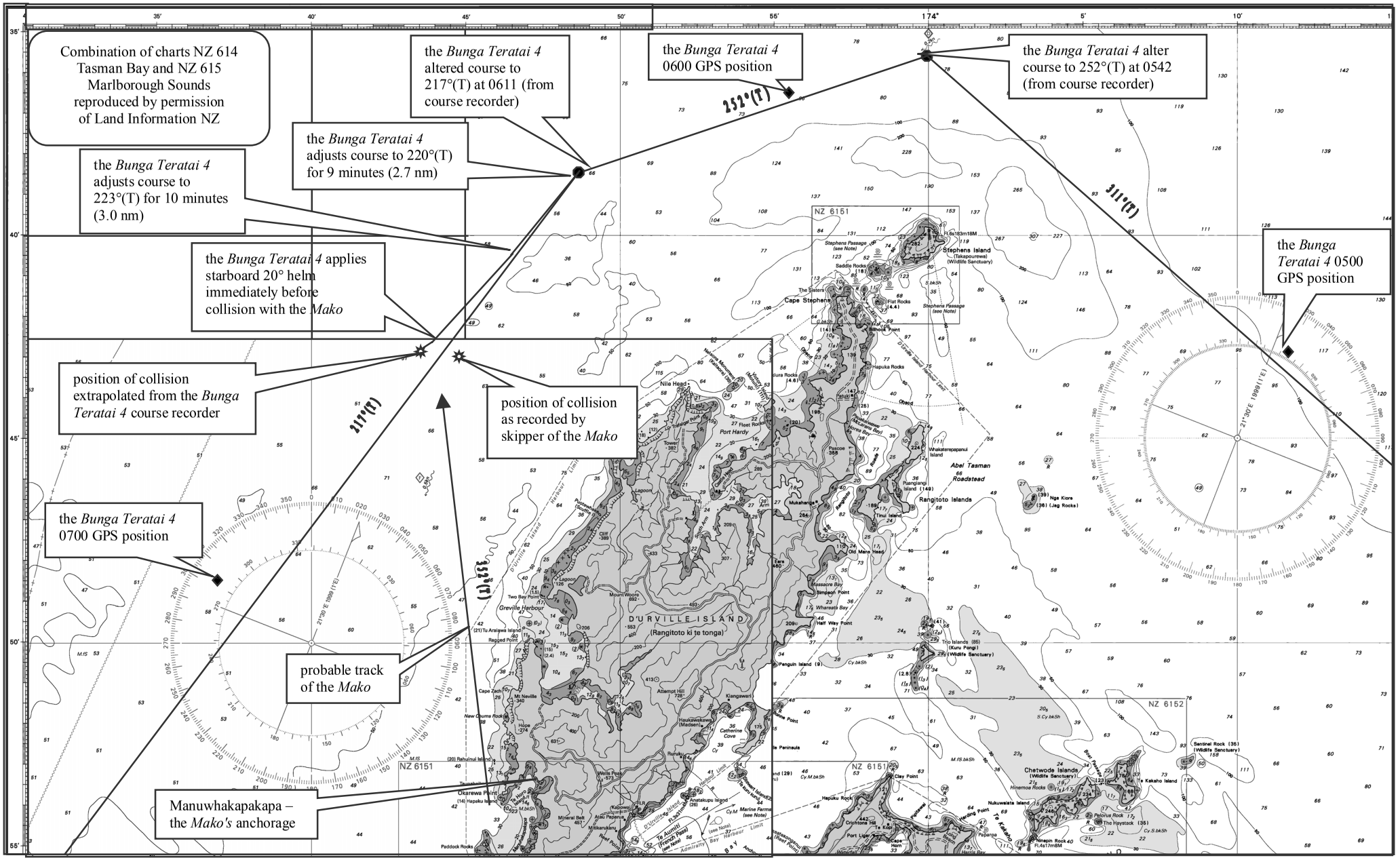


Figure 1

Combination of charts NZ 614 and 615 showing the respective tracks of the *Bunga Teratai 4* and the *Mako*

1 Factual Information

1.1 Narrative

1.1.1 The *Mako* was an inshore fishing vessel operating in Tasman Bay. The vessel had sailed from Nelson on Saturday 28 June 2003, and before the accident on 4 July had been fishing off D'Urville Island during the days, and anchoring overnight in one of the small sheltered bays on the west coast of the island.

1.1.2 The *Bunga Teratai 4* was a container ship trading from New Zealand and Australian ports to Malaysia and Singapore. At the time of the collision it was on passage from Lyttelton to Nelson.

1.1.3 The *Bunga Teratai 4* sailed from Lyttelton at 1736 on Thursday 3 July 2003 and steamed at full service speed towards Nelson, through Cook Strait. The ship was expected to arrive at the Nelson pilot station at 0900 on Friday 4 July 2003.

1.1.4 On the evening of Thursday 3 July 2003, the *Mako* landed its last trawl of the day at about 1900. The skipper then steamed to Manuwhakapakapa (see Figure 1) where the vessel anchored at about 2100.

1.1.5 At 0400 on Friday morning, the chief officer of the *Bunga Teratai 4* took over the navigational watch from the second officer. At that time the ship was in the northern part of Cook Strait. On the 4 to 8 watch, accompanying the chief officer were a deck cadet and a lookout/helmsman. The ship was on a course of 311°(T) and making about 16.5 knots (measured between positions in the global positioning system (GPS) logbook).

1.1.6 At about 0430 on that Friday morning, the skipper of the *Mako* was awoken by his alarm clock. He did preparatory checks before starting the main engine. At about 0445, after the engine had warmed through, he weighed the anchor and sailed out of Manuwhakapakapa. Once the *Mako* was clear of the bay, the skipper engaged the autopilot and, on the Seaplot electronic chart, aligned the vessel's head with the cursor that was positioned over where he was going to start fishing that day. He could not recall the actual course that he set on the autopilot. He intended to shoot the net at the northern extremity of the 6-mile tow, a regular fishing area, and trawl towards the south-southwest.

1.1.7 At 0542, the *Bunga Teratai 4* was due north of Stephen's Island light (see Figure 1). Shortly before this time the chief officer had put the ship into manual steering with the helmsman on the wheel. The chief officer ordered port helm and the helmsman brought the ship around to the new course of 252°(T).

1.1.8 Shortly before 0610, the deck cadet identified a radar target on the ship's port bow. Soon after, the chief officer, the able seaman and the deck cadet saw the lights of the target but were unable to identify the type of vessel. At 0611, the ship arrived at its next course alteration position and the chief officer ordered the helmsman to alter course to port. As the ship came onto its next heading of 217°(T) the chief officer became concerned the ship's head was close in line with the target, and so he adjusted the course to 220°(T). He maintained this course for about 9 minutes.

1.1.9 The skipper of the *Mako* said that he arrived at his shooting position at about 0620, and then brought the throttle back to idle before declutching the engine. Prior to this he had been maintaining a lookout by radar and visually, but had not seen the container ship. When stopped, the skipper said he switched on the not under command lights and turned the wheelhouse interior lights on so that he could complete the documentation required by the Ministry of Fisheries.

1.1.10 After maintaining a course of 220°(T) for 9 minutes, the chief officer of the *Bunga Teratai 4* was still concerned about the vessel on his port side. He had not monitored the progress of the target but he adjusted the ship's course a further 3° to starboard onto 223°(T). The chief officer maintained that course until immediately before the collision when he ordered 20° starboard helm having realised there was an imminent threat of collision.

1.1.11 The skipper of the *Mako* said that he went down to call the crew at 0630. He put on the electric kettle for hot drinks and was just going to wake up the crew when the collision occurred.

1.1.12 The bridge team on the *Bunga Teratai 4* thought that the fishing vessel had cleared their stern, and that a collision had been avoided, so they regained their intended course and continued to Nelson.

1.1.13 The skipper of the *Mako* thought that the port paravane arm was the first point of contact with the hull of the container ship, with the bow hitting soon after.

1.1.14 The crew of the fishing vessel were woken by the collision and so did not recollect the impact. The skipper said that immediately after the collision he went to the bow to inspect the damage and then checked the forward compartments for flooding and found that there was no ingress of water. He checked the engine room, which was also intact. The principal damage was to the bow under the anchor fairlead, and the port paravane arm which was badly bent with a broken stay. Once he determined that the *Mako* was not in immediate danger he got the crew to clear away and house the broken paravane arm and paravane. They then housed the starboard paravane.

1.1.15 Following the collision, neither vessel tried to contact the other by very high frequency (VHF) radio.

1.2 Vessel information

1.2.1 The *Mako* was a restricted limit fishing vessel allowed to operate within 100 nm of the coastline of New Zealand, Stewart Island and the Chatham Islands. It had a length overall of 23.24 m, a tonnage of 99.82, and a single main diesel engine of 272 kW which drove, through a reduction gearbox, a fixed pitch 4-bladed propeller. The vessel was built in St Augustine, Florida in 1978 and was constructed of glass reinforced plastic (GRP).

1.2.2 The *Mako* was operated by McDonald and Brown Limited, who had brought the vessel to New Zealand in 1978. It was a multi-purpose fishing vessel being able to trawl, troll and dredge. At the time of the collision it was being used to trawl for warehou in depths of about 50 m.

1.2.3 The *Mako* had entered the safe ship management system with Survey Nelson Safe Ship Management Company Limited in May 1997. Its current certificate was issued on 9 January 2003 and, subject to periodic inspections, was valid until 28 January 2006.

1.2.4 The *Mako* was fitted with the following relevant navigation equipment, which was operational at the time of the collision:

GPS	Furuno GP31
track plotter	Seaplot v5.01
radar	Furuno FR8111
autopilot	Furuno FAP-300

1.2.5 On 7 July 2003, the navigation equipment on the *Mako* was checked by an electronic navigation specialist. He found the GPS was set to the correct datum and was functioning normally. The track plotter used the Furuno GPS derived data and was operating normally, but the facility for recording the track history had not been instigated. The radar operated normally on both short and long ranges.

1.2.6 The wheelhouse of the *Mako* was fitted with a watch alarm, which was a device to wake watchkeepers should they fall asleep. It was set to activate a light at a predetermined time interval that the watchkeeper has to manually cancel. Failure to cancel resulted in an audible alarm. The watch alarm was not operating at the time of the collision. The safe ship management operations manual did not contain any reference to the watch alarm, but the operator said that his skippers had been told to use the alarm when steaming during the hours of darkness.

1.2.7 The *Bunga Teratai 4* was a 1725 TEU container ship with a length overall of 184.0 m and a gross registered tonnage of 21 339. It was powered by a B&W 6560MC diesel main engine which developed a Maximum Continuous Rating (MCR) of 16 680 brake horsepower at 105 revolutions per minute. The ship was propelled by a fixed pitch 5-bladed propeller, and had a service speed of 19.0 knots. It had a semi-spade type rudder.

1.2.8 The ship was built in Korea in 1998 at Daewoo Heavy Industries Ltd. It was owned and operated by the Malaysia International Shipping Corporation and was in class with Lloyds Register of Shipping. All the statutory certificates issued by or on behalf of the Malaysian government were current.

1.2.9 The *Bunga Teratai 4* was equipped with the following navigation equipment, which was operational at the time of the collision:

autopilot/steering console	Tokimec PR-8000
starboard radar	JRC JMA-9000, ARPA enabled
port radar	JRC JMA-9000, no ARPA
GPS	JRC
VHF radio x 2	JRC JHS 32A
rudder indicator	360° visible from centre of wheelhouse

1.3 Personnel information

1.3.1 The Skipper of the *Mako* had been fishing for 18 years and had worked on different types of fishing vessels throughout his career. He gained his New Zealand Coastal Master certificate in May 1995 and his Second Class Diesel Trawler Engineer Certificate in March 1996. He had been sailing as skipper for the previous 2 years, the last 6 months of which had been on the *Mako*.

1.3.2 There were 3 other crew members on the *Mako*, one had 6 years experience and held a Qualified Fishing Deckhand Certificate, one had 4 years experience but held no certification, and one had completed a seafood technology course between March and May 2003 and was on his second trip on a fishing vessel since completing that course.

1.3.3 The *Bunga Teratai 4* had a complement of 30 crew of multinational origin but predominately Malaysian. There were 3 navigating officers, each in charge of a traditional 4-hour watch (12 to 4, 4 to 8 and 8 to 12). There were 2 deck cadets who kept watch with the second officer (12 to 4) and chief officer (4 to 8). An able seaman was appointed to each navigation watch. The collision occurred during the 4 to 8 watch, at which time the chief officer, a deck cadet and an able seaman were on watch.

1.3.4 The chief officer was an Indonesian national who went to sea in 1991 and held a Republic of Indonesia Certificate of Competency as a Deck Officer Class II, which was issued on 6 March 2002. The certificate was issued under the provisions of the International Convention on Standards of Training, Certification and Watchkeeping of Seafarers 1978, as amended in 1995 (STCW95). He had joined the *Bunga Teratai 4* in May 2003.

1.3.5 The able seaman held a certificate as a Rating Forming Part of a Navigation Watch issued by the Government of Malaysia under the provisions of STCW95.

1.3.6 The deck cadet had completed 2 semesters at the Malaysian Maritime Academy before joining the *Bunga Teratai 4* on 28 April 2003, as his first ship. He had been on watch with the previous chief officer, then spent a month with the second officer, and had started duty with this chief officer on the ship's arrival in Auckland on 30 June 2003.

1.4 Actions prior to the collision

1.4.1 The courses steered by the *Bunga Teratai 4* were recorded on a course recorder. The courses in the hours leading up to the collision, as shown on the recorder, were very similar to those recalled by the crew.

1.4.2 Shortly after 0600 in the morning of 4 July 2003, the deck cadet was observing the radar and noticed a target on the port bow at a distance of about 10 nm. Shortly afterwards, the able seaman on watch saw the lights of the target. The cadet commenced plotting the target on the Automatic Radar Plotting Aid (ARPA) and was passing the information from the ARPA to the chief officer. After the accident, the cadet could not remember any of the data that was displayed on the ARPA, nor what information he had given the chief officer. The target was observed visually before the ship's course was altered at 0611. Prior to the collision, the chief officer did not take any bearings, either visual or by radar, to ascertain whether a close quarter situation was developing or what effect the avoiding action he had taken may have.

1.4.3 Shortly after 0611, as the ship began to steady on the new course of 217°(T), the chief officer decided to give the other vessel more room and ordered the helmsman to steer 220°(T). After about 9 minutes on that course he ordered a further adjustment of the course to starboard to 223°(T) (The course recorder showed these courses to be 219° and 222° respectively). He remained on 223°(T) until almost immediately before the collision.

1.4.4 While the ship was on 223°(T) the chief officer tried, unsuccessfully, to contact the fishing vessel on the VHF radio channel 16.

1.4.5 As the 2 vessels closed, the bridge team on the *Bunga Teratai 4* was able to identify the navigation lights being exhibited by the other vessel. They recalled seeing a white masthead light and a green sidelight. In addition, there were bright decklights on its afterdeck.

1.4.6 Section 1.0 of the operations manual of the *Bunga Teratai 4* deals with the responsibility of navigation officers, including the master. Paragraph 1.5.1 concerns the officer of the watch and states:

> The watchkeeping officer, as proxy to the master, has the responsibility for always ensuring safe navigation of the ship. The watchkeeping officer shall strictly observe the applicable rules for avoiding collision or close quarter situation at sea at all times.

Section 1.11 of the manual outlines the bridge watchkeeping instructions, relevant paragraphs read as follows:

> If the watchkeeping officer recognizes the presence of another ship or its navigation lights in the vicinity, he shall immediately confirm a change in the bearing of the ship on the compass and judge the risk of collision.
>
> If the watchkeeping officer is unable to detect definite change in the compass bearing of another approaching ship, he shall judge the situation as a risk of collision.
>
> If the watchkeeping officer is unable to confirm a risk of collision with another ship, he shall judge the situation as a risk of collision.
>
> If the watchkeeping officer takes action to avoid collision with another ship, he shall do so with an adequate time margin, and shall confirm the effects of the action carefully until the other ship is at a safe distance from his own ship.

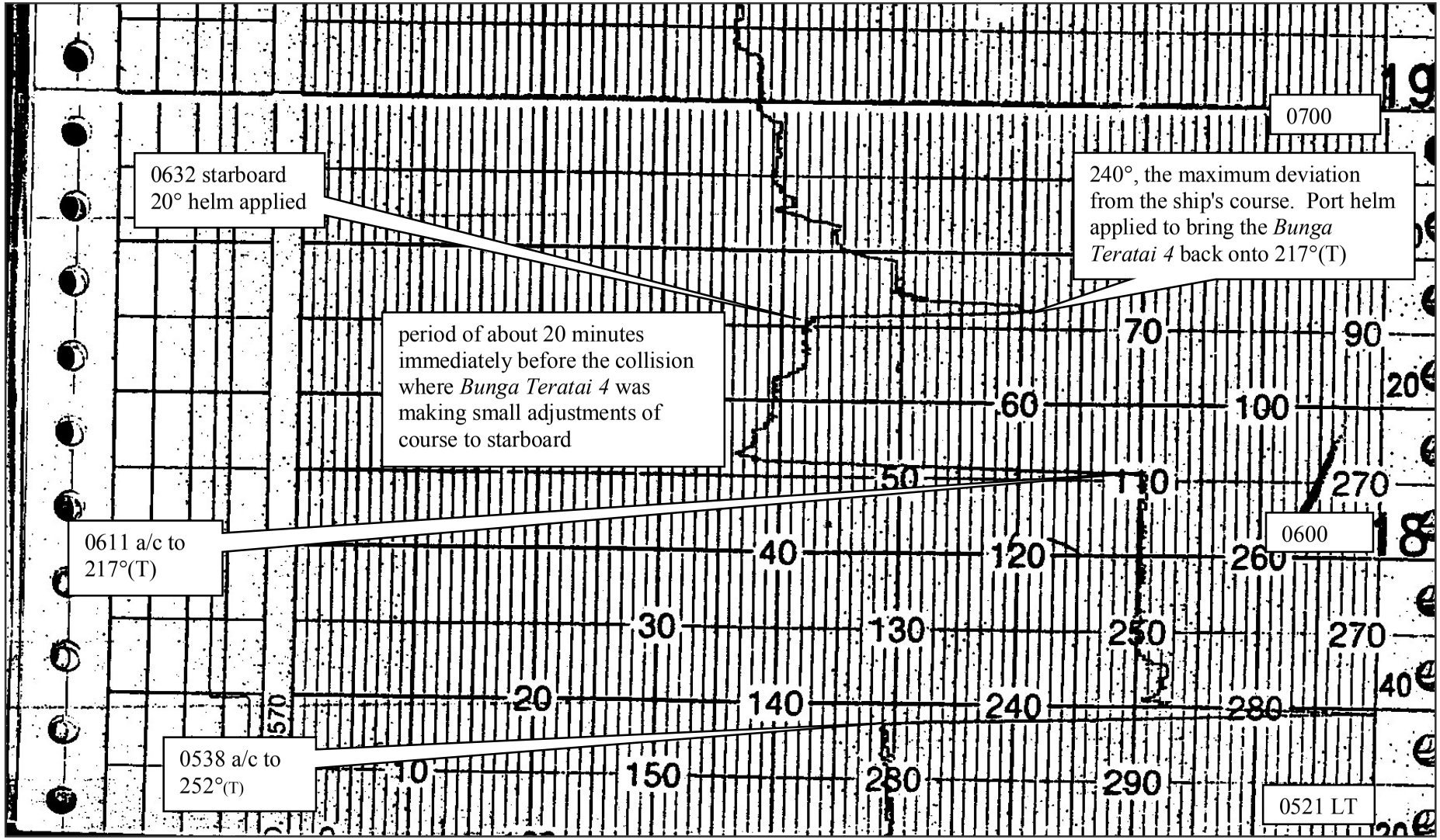


Figure 2
Section of the course recorder from the *Bunga Teratai 4*

1.4.7 None of the crew on board the *Bunga Teratai 4* saw the 2 red vertically displaced not under command lights that the skipper of the *Mako* said he had turned on when he stopped his vessel.

1.4.8 Over the 19 minutes immediately preceding the collision, the two 3° alterations of course made by the chief officer of the *Bunga Teratai 4* resulted in the ship being approximately 0.274 nm [507 m] to the west of its original course at the time of the collision.

1.4.9 The course of the *Mako* from leaving Manuwhakapakapa to the position of the collision was about 353°(T). Assuming that the *Mako* maintained a speed of 8 kts, over the 19 minutes before the collision, the fishing vessel would have travelled 2.66 nm, which would have resulted in a westing of 0.32 nm [600 m], nearly 100 m more than the westing by the *Bunga Teratai 4* over the same period.

1.4.10 Immediately before the collision the chief officer of the *Bunga Teratai 4* ordered the helm to 20° to starboard. When a ship turns it rotates about a pivot point, which for a ship moving ahead is between one-quarter and one-half of its length from forward. Consequently, when a ship turns to starboard, its stern will swing out to port.

1.5 Physical evidence

1.5.1 The crew of the *Bunga Teratai 4* said they were sure that the fishing vessel had passed their stern, albeit very closely. None of the bridge team said that they felt any collision, but the helmsman indicated that there was a sound similar to a large sea hitting the side of the ship.

1.5.2 The port quarter of the ship, close to the transom, had distinct score marks at 3 vertical levels, commensurate with 3 points of contact; the anchor, the paravane arm and the top of the wheelhouse.

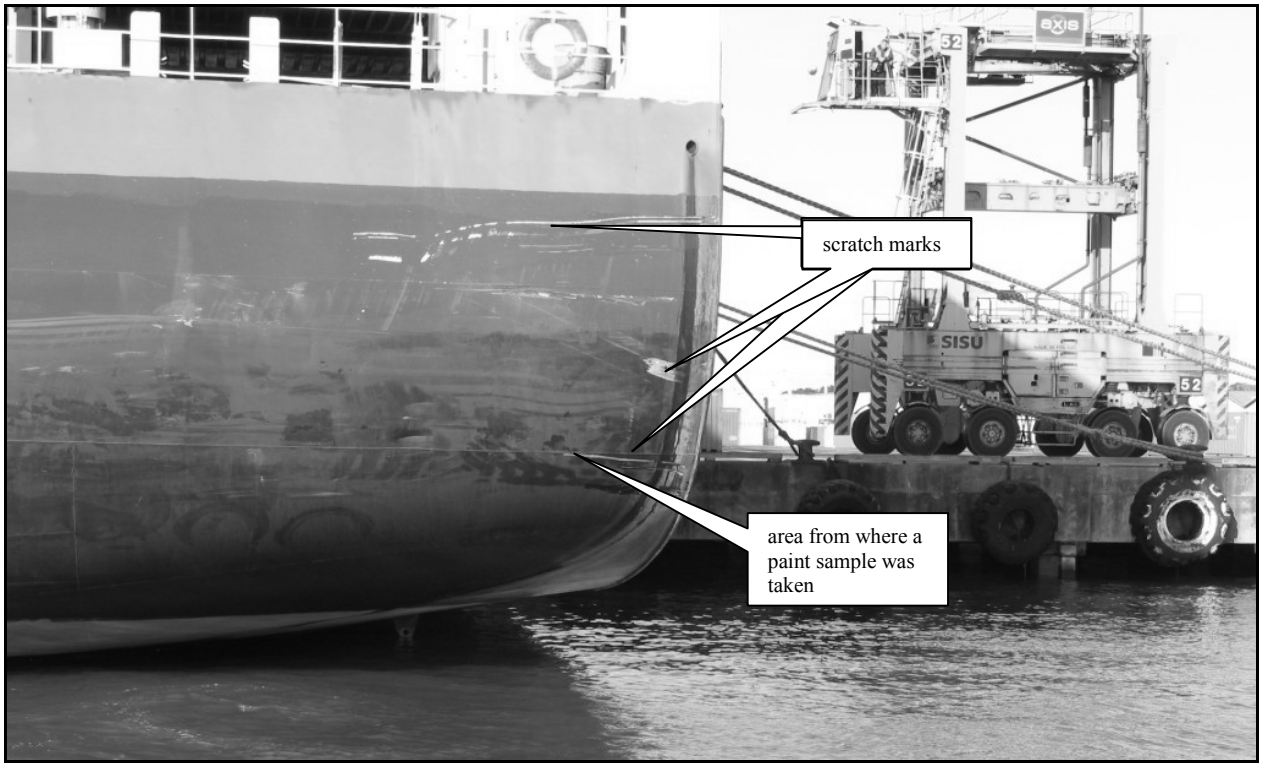


Figure 3
Photograph of the after port quarter of the *Bunga Teratai 4* taken in Auckland, Tuesday 8 July 2003

1.5.3 In order to confirm that a collision did occur, paint samples found embedded in the *Mako*'s anchor were compared with paint from the lower scratches on the hull of the ship. The Institute of Environmental Science and Research Limited (ESR) carried out the comparison and produced a report which stated in part:

> The paint from *Bunga Teratai 4* (item 1) consisted of seven layers of paint. These were five black layers on top of two gold layers. If I label these layers 1-7 then layers 1-5 are black and 6&7 are gold. The paint from F/V *Mako* (item 2) consisted of four layers. These were three black layers on a gold layer. The visual and colour correspondence is between these four layers and layers 3,4,5 &6 of the paint from *Bunga Teratai 4* (item 1). There is a good correspondence of chemical composition between the black paints and between the gold paints. In my opinion this evidence very strongly supports the suggestion that the two paint samples have the same source.

Photographs at Figures 4 and 5 show the paint samples as seen through a scanning electron microscope with areas of concurrence between the 2 samples identified.

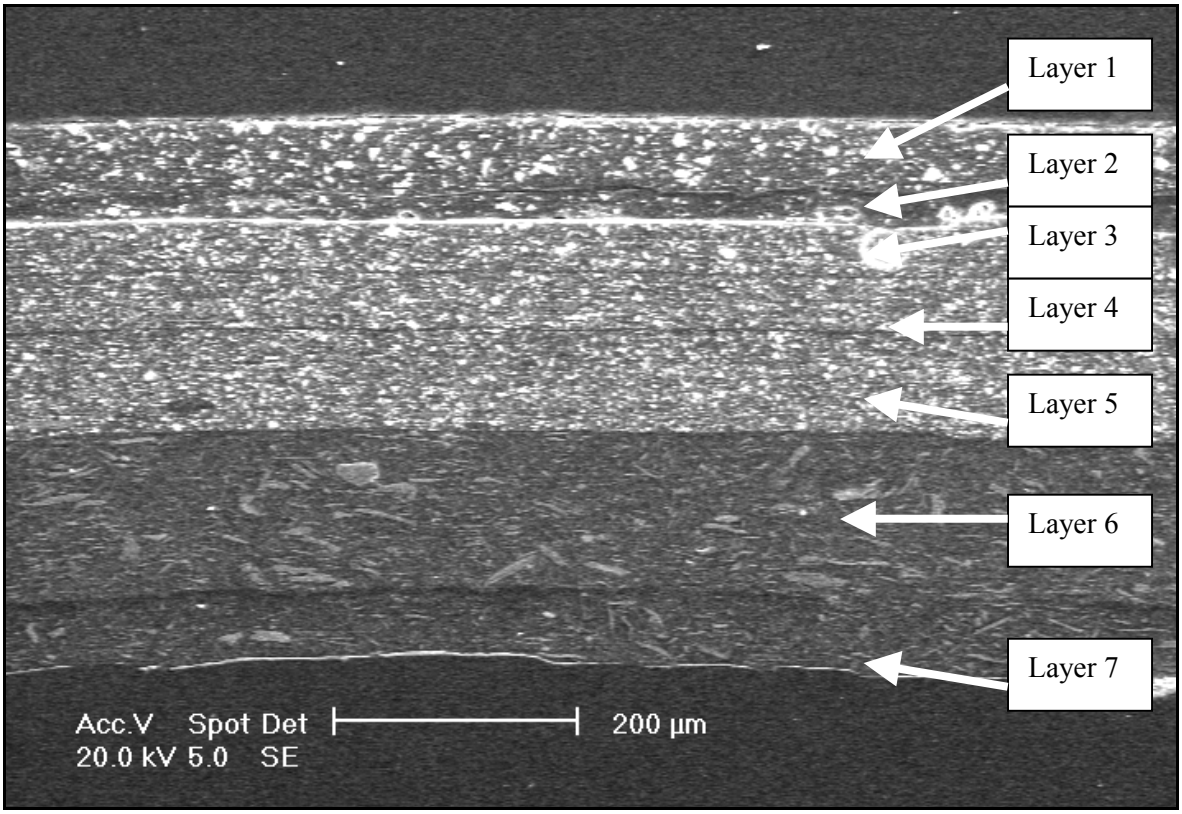


Figure 4
Paint sample from the *Bunga Teratai 4* under an electron scanning microscope

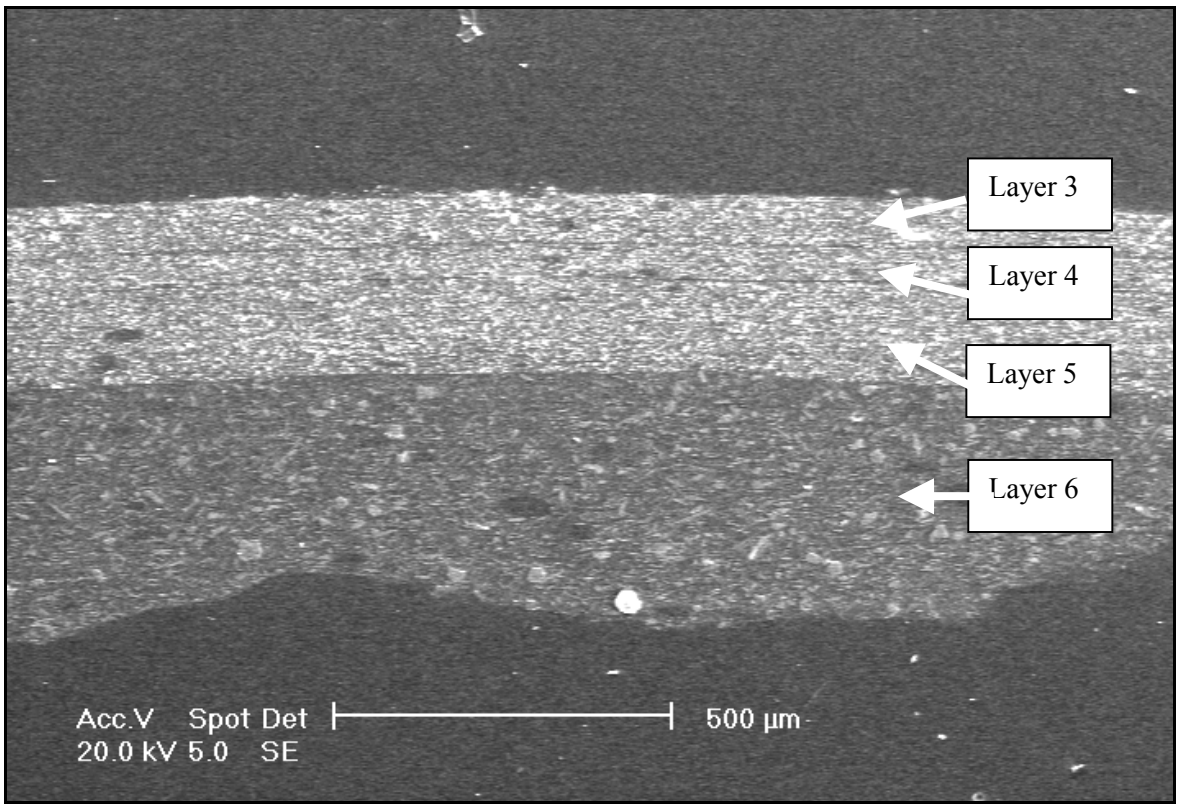


Figure 5
Paint sample from the anchor of the *Mako* under an electron scanning microscope

1.5.4 A crewmember on watch on another fishing vessel about 5 nm to the south of the collision position said that he had seen the lights of the *Mako* and the container ship before the collision. The vessels were too far from this observer to see the actual collision, but he did see the 2 radar targets merge into one before coming apart again. He was also under the impression that the *Mako* was steaming throughout the period before and at the time of the collision.

1.6 Time of collision

1.6.1 There was confusion over the time of the collision. The skipper of the *Mako* thought it was some time around 0630, while the crew of the ship initially said that the collision occurred at about 0730.

1.6.2 The chief officer's practice when charting the ship's position was to only annotate the position on the chart with the minutes of the time and not the hour. Inexplicably, he, and the deck cadet, managed to misinterpret the times of the positions one hour after they had actually occurred.

1.6.3 In addition to plotting positions on the chart, the officer of the watch was required to enter hourly the GPS-derived positions into a logbook. When plotted, the times and positions recorded in the GPS logbook, and the times and courses on the course recorder, support the contention that the collision occurred at 0632.

1.6.4 Following the collision, and once the skipper of the *Mako* had determined that they were not in immediate danger, he tried to call the operator of the fishing vessel using the cellular telephone on the vessel. He failed to reach the operator but left a message on his voicemail. This call was recorded by Telecom to have occurred at 0643.

1.6.5 The position of collision recorded by the ship and the fishing vessel were on the same latitude but differed by just over one minute of longitude, about one nautical mile.

1.6.6 The master of the *Bunga Teratai 4* noted protest on 7 July 2003 at Tauranga and in the enclosed statement of facts he had indicated that the time of the alleged collision was at 0736. On 17 July 2003, after further consideration on his part, the master confirmed to the Commission by email that the time of the avoidance manoeuvre recorded by the ship was incorrect by one hour, and the collision did occur shortly after 0630.

1.6.7 Sunrise on 4 July in position 40° 43'S 173° 43'E was at 0750 and civil twilight began at 0719. Moonrise was at 1125 and so it was not visible at the time of the accident.

1.6.8 In the early stages of the investigation, the discrepancy between the times recorded by each party was difficult to reconcile, so all the witnesses were questioned about the state of natural light at the time of the collision. All the witnesses agreed that it was dark to the extent that only lights could be seen, thus supporting the conclusion that the collision occurred at about 0630 rather than at 0730 when twilight would have begun.

1.7 Point of impact

1.7.1 The *Mako* had been retrospectively fitted with stabilising arms, which extended about 12 m at right angles to the fore and aft line, about one third of the vessel's length from forward. From the outboard end of each of these arms a paravane was dangled into the sea to help reduce the rolling of the vessel in a seaway.

1.7.2 The skipper thought that the port arm had been the first point of contact with the ship's hull. The vessels' courses were plotted, showing that it was probable the arm and the bow would have made contact almost simultaneously (see Figure 6). Which occurred first would depend on the ship's actual heading at the time of the collision.

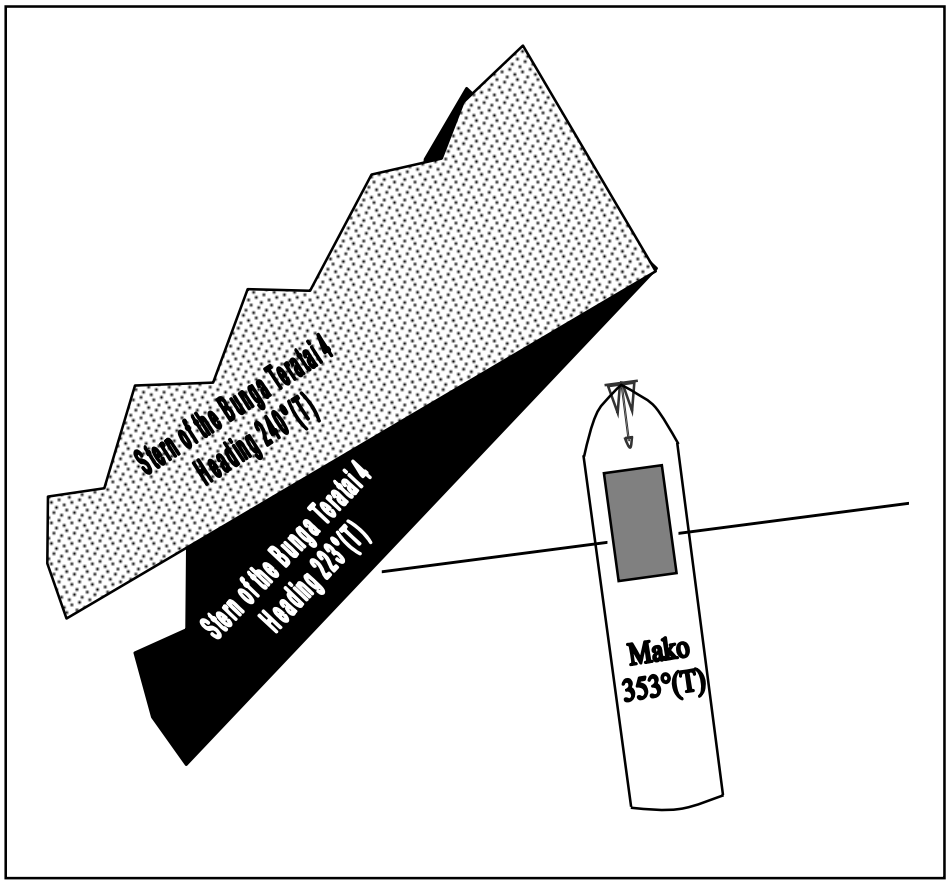


Figure 6
Diagram to show the possible points of contact between the 2 vessels

1.8 Fatigue

1.8.1 The crew of the *Bunga Teratai 4* maintained 4-hour watches, allowing them sufficient time for sleep. Although the regularity of those watches would have been disrupted by port arrivals and departures, they would have been able to get sufficient rest. Fatigue of the ship's crew was not considered as a contributing factor.

1.8.2 The *Mako* had been fishing for 5 days. During that time the crew were working long hours. The skipper in particular was required to navigate the vessel to the fishing grounds in the morning and back to an anchorage in the evenings. The skipper provided the following information:

Date	Time of anchoring	Time of weighing anchor	Period of possible sleep
28 June	sailed from Nelson at 0200 and fished during the day		
28 June/29 June	2100	stayed at anchor due to adverse weather	
29 June/30 June	n/a	0545	
30 June/1 July	2100	0600	9 hours
1 July/2 July	2030	0630	10 hours
2 July/3 July	1700	0430	11.5 hours
3 July/4 July	2100	0430	7.5 hours
4 July	Collision		

The skipper said that he would be in bed within 15 minutes of setting the anchor and his alarm would wake him 10 minutes before hauling the anchor. On 29 June, the weather was sufficiently bad to prevent the vessel from being able to fish so the vessel remained at anchor throughout the whole day during which the skipper said he got at least 12 hours sleep.

1.8.3 For the 6-month period that the skipper had been working on the *Mako* he had only had one trip (one week) off. Other than that he had had the one or two days off between trips. There were also a number of days when the vessel required maintenance or was under survey when the skipper was able to take time off.

1.9 Collision regulations

1.9.1 The International Regulations for Preventing Collisions at Sea, 1972 (Colregs), apply to all vessels upon the high seas and in all waters connected therewith navigable by seagoing vessels. In New Zealand, Maritime Rules Part 22 gives effect to the Convention on the International Regulations for Preventing Collisions at Sea, 1972. Part 22 provides the steering and sailing rules for ships, as well as standards for the installation, performance and use of lights for collision avoidance and the sound and light signals used for communication of safety information. There are minor editorial changes between the Colregs and Part 22, but the changes do not alter the meaning of the rules pertaining to this occurrence.

1.9.2 The paragraphs of Maritime Rules Part 22 relevant to this investigation are:

> 22.5 Look-Out
>
> Every vessel must at all times maintain a proper look-out by sight and hearing as well as by all available means appropriate in the prevailing circumstances and conditions, so as to make a full appraisal of the situation and the risk of collision.

22.7 Risk of Collision

(1) Every vessel must use all available means appropriate to the prevailing circumstances and conditions to determine if the risk of collision exists. If there is any doubt, such risk must be considered to exist.
(2) Proper use must be made of radar equipment, if fitted and operational, including long-range scanning to obtain early warning of the risk of collision and radar plotting or equivalent systematic observation of detected objects.
(3) Assumptions must not be made on the basis of scanty information, especially scanty radar information.
(4) In determining if the risk of collision exists, the following considerations must be among those taken into account —

(a) such risk must be considered to exist if the compass bearing of an approaching vessel does not appreciably change; and
(b) such risk may sometimes exist even when an appreciable bearing change is evident, particularly when approaching a very large vessel or a tow or when approaching a vessel at close range.

22.8 Action to Avoid Collision

(1) Any action to avoid collision must, if the circumstances of the case allow, be positive, made in ample time and with due regard to the observance of good seafaring practice.
(2) Any alteration of course or speed or both to avoid collision must, if the circumstances of the case allow, be large enough to be readily apparent to another vessel observing visually or by radar. A succession of small alterations of course or speed or both should be avoided.
(3) If there is sufficient sea-room, alteration of course alone may be the most effective action to avoid a close-quarters situation provided that—

(a) it is made in good time; and
(b) it is substantial; and
(c) it does not result in another close -quarters situation.

(4) Action taken to avoid collision with another vessel must be such as to result in passing at a safe distance. The effectiveness of the action must be carefully checked until the other vessel is finally past and clear.
(5) If necessary, to avoid collision or to allow more time to assess the situation, a vessel must slacken its speed or take all way off by stopping or reversing its means of propulsion.
(6) (a) A vessel that, by any rules in this Part, is obliged not to impede the passage or safe passage of another vessel must, when required, take early action to allow sufficient sea-room for the safe passage of the other vessel.

(b) A vessel that is required not to impede the passage or safe passage of another vessel is not relieved of this obligation if approaching the other vessel so as to involve risk of collision. It must, when taking action, have full regard to the action which may be required of itself and the other vessel by this section of Part 22.
(c) A vessel the passage of which is not to be impeded remains fully obliged to comply with this section of Part 22 when the two vessels are approaching one another so as to involve risk of collision.

22.15 Crossing Situation

When two power-driven vessels are crossing so as to involve risk of collision, the vessel which has the other on its own starboard side must keep out of the way. The vessel required to keep out of the way must, if the circumstances of the case allow, avoid crossing ahead of the other vessel.

22.16 Action by Give-Way Vessel

Every vessel which is directed to keep out of the way of another vessel must, so far as possible, take early and substantial action to keep well clear.

22.17 Action by Stand-On Vessel

(1) If one of two vessels is to keep out of the way, the other must keep its course and speed.
(2) As soon as it becomes apparent to the stand-on vessel that the vessel required to give way is not taking appropriate action in compliance with this Part—
(a) it may take action to avoid collision by its manoeuvre alone; and
(b) if it is a power-driven vessel in a crossing situation, if the circumstances of the case allow, it must not alter course to port for a vessel on its own port side.
(3) When, from any cause, the stand-on vessel finds itself so close that collision cannot be avoided by the action of the give-way vessel alone, it must take whatever action will best avoid collision.
(4) This rule does not relieve the give-way vessel of its obligation to keep out of the way.

22.34 Manoeuvring and Warning Signals

(4) When vessels in sight of one another are approaching each other and for any reason either fails to understand the intentions or actions of the other, OR is in any doubt whether sufficient action is being taken by the other to avoid collision, the vessel in doubt must immediately indicate such doubt by sounding the following signal on its whistle—

at least five short and rapid blasts.

This signal may be supplemented by a light signal of at least 5 short and rapid flashes.

2 Analysis

2.1 There were conflicting accounts of the circumstances surrounding the collision.

2.2 The scrapes on the port quarter of the *Bunga Teratai 4* and the forensic analysis of the paint sample provided sufficient evidence to confirm that a collision did occur.

2.3 The information gained from the ship's crew after the collision was confused primarily because of the misunderstanding over the time that the collision occurred. The chief officer and cadet were both sure that the collision was at about 0730, rather than at 0630 as was confirmed later. The evidence from the course recorder showed that the chief officer of the *Bunga Teratai 4* did make alterations of course to starboard during the 19 minutes before the collision.

2.4 From the time the target was first identified until the collision, the first trip cadet observed it on the starboard radar and relayed information to the chief officer. It appears that the chief officer did not monitor the cadet's use of the radar and took little or no notice of the information the cadet gave him. This was indicative of poor bridge resource management on the *Bunga Teratai 4*.

2.5 The skipper of the *Mako* was the only person on watch on that vessel, and so no alternative evidence was available to collaborate his version of events. The Seaplot electronic plotting system did have an automatic tracking facility, but this was not activated and so no history of the trip was available.

2.6 The individual bridge team members of the *Bunga Teratai 4* independently confirmed that the fishing vessel was on their port side throughout the period. They also confirmed that when they could distinguish the navigation lights on the fishing vessel they could see a masthead light, a green sidelight and bright deck lights on the afterdeck. At no time did they see the red, not under command, lights that the skipper said the *Mako* was exhibiting.

2.7 The independent witness on a fishing vessel about 5 nm to the south did not see the not under command lights. However, the bright afterdeck lights of the fishing vessel may have obscured the not under command lights at that distance.

2.8 The prevailing wind and currents would have similarly affected the 2 vessels and so these have been ignored when considering the relative movements of each vessel. The alterations of course made by the *Bunga Teratai 4* in the 19 minutes immediately before the collision resulted in the ship being about 500 m to the west of its original course.

2.9 The course between Manuwhakapakapa and the collision was approximately 353°(T). On this course at its usual service speed of 8 knots, the *Mako*, in the 19 minutes before the collision, would have made 600 m towards the west.

2.10 The *Mako* was on the port side of the *Bunga Teratai 4* throughout the period immediately before the collision. So, for the collision to occur the fishing vessel had to travel a minimum of 500 m towards the west during the 19 minutes prior to the collision. This indicates that the *Mako* was making way at the time of the collision, not stopped as suggested by its skipper.

2.11 The skipper of the *Mako* confirmed that he was not on the bridge at the time of the collision and so was not keeping a proper lookout as required by Maritime Rules Part 22.5, Look-Out.

2.12 The bridge team of the *Bunga Teratai 4* did not adequately assess the risk of collision as required by Maritime Rules Part 22.7**,** Risk of Collision, and their own operations manual. The action they took to avoid collision did not meet the requirement of Maritime Rules Part 22.8, Action to Avoid Collision, in that the course alteration was not sufficiently substantial to prevent the collision and the effect it had was not monitored.

2.13 Under the meaning of the Maritime Rules Part 22, both vessels were power driven vessels with no special limiting manoeuvring characteristics. They were crossing vessels and the *Mako* had the container ship on its own starboard side. The *Mako* was therefore the give way vessel and under Maritime Rules Part 22.15, Crossing Situation, it should have kept clear of the *Bunga Teratai 4;* this it failed to do.

2.14 The *Bunga Teratai 4* was the stand-on vessel and Maritime Rules Part 22.17, Action by Stand-On Vessel, required it to maintain its course and speed, but did allow that as soon as it became apparent to the stand-on vessel that the vessel required to give way was not taking appropriate action, the stand-on vessel may take action to avoid a collision by its manoeuvre alone. The chief officer of the *Bunga Teratai 4* did not maintain his course, and the alterations that he did make were small and did not adequately remove the risk of collision.

2.15 Neither vessel sounded the appropriate sound signal of at least 5 rapid blasts on its whistle as required by Maritime Rules, Part 22.34(4), Manoeuvring and Warning Signals.

2.16 The skipper of the *Mako* had, with the exception of one week, been working continuously since January. He did get between 24 and 48 hours off the vessel between each fishing trip. When fishing he worked long hours. The accumulation of a long period of work without a substantial break and long working hours might have resulted in him being chronically fatigued.

2.17 The skipper of the *Mako* said that he had not seen the container ship on the radar. Three days after the collision the *Mako*'s radar was checked by an electronics expert in Port Nelson and found to be operating normally. The skipper confirmed that he had managed to navigate on a dark night out of the anchorage at Manuwhakapakapa using the radar. He said that he could see the coastline of D'Urville Island on the radar before and shortly after the collision. It is unlikely that a radar would display a coastline at a distance of 6 nm but not show a large ship target at a similar range.

2.18 The witness on another fishing vessel was able to see the container ship's return on his radar at a distance of at least 8 nm. This indicates that the *Bunga Teratai 4* did give a good radar return.

The *Mako*'s radar was operating suggesting that the skipper did not see the target of the *Bunga Teratai 4* because he was not observing the radar or he had adjusted the controls to such an extent that no targets were displayed on the screen.

2.19 Despite having radar and the *Mako* heading directly towards the container ship, the skipper failed to see it. There were no obscuring background lights to mask the presence of the ship, and from witness reports the weather conditions did not reduce visibility. It is difficult to comprehend why the skipper did not observe the ship either visually or by radar in the 20 minutes before the collision unless he was absent from the *Mako*'s wheelhouse, or asleep, or both.

2.20 The angle of contact between the two vessels was between 50° and 67° dependant on how much the *Bunga Teratai 4* had altered course at the actual time of collision. The angle of impact was sufficiently broad to cause damage to the bow and the paravane arm of the fishing vessel, but was acute enough to allow the *Mako* to glance off and pass around the ship's stern.

2.21 The operator said that he had told the skippers to use the watch alarm when steaming at night, yet there were no written instruction to that effect. The skipper of the *Mako* did not activate the watch alarm and so, if he had fallen asleep, the defence that the alarm gave had been removed.

2.22 The starboard 20° helm order given by the chief officer immediately before the collision, had the effect of turning the ship's stern towards the fishing vessel close on the ship's port side. Given that the point of contact was in the after 20 m of the ship's length, had the ship maintained its course, or even turned to port, the collision may have been avoided, or the impact reduced.

3 Findings

Findings and safety recommendations are listed in order of development and not in order of priority.

3.1 The bow of the fishing vessel *Mako* collided with the port quarter of the container ship *Bunga Teratai 4*.

3.2 At the time of the collision the skipper of the *Mako* was not in the wheelhouse of his vessel and so was not keeping a proper lookout.

3.3 The skipper of the *Mako* did not observe, either visually or by radar, the container ship before the collision, which indicates that he was not keeping a safe navigation watch.

3.4 The physical evidence indicates that the *Mako* was making way at the time of the collision.

3.5 There was no evidence to corroborate the skipper of the *Mako*'s assertion that the fishing vessel was showing the two red vertically displaced not under command lights at the time of the collision.

3.6 The 2 vessels were in a crossing situation as prescribed in the Maritime Rules, Part 22. The *Mako* had the *Bunga Teratai 4* on her own starboard side and was therefore the give way vessel. Consequently, the *Bunga Teratai 4* was the stand-on vessel.

3.7 The *Mako* did not take any action to avoid a collision as required by Maritime Rules, Part 22.16.

3.8 The chief officer of the *Bunga Teratai 4* did not maintain course and speed as required of the stand-on vessel by Maritime Rules, Part 22.17.

3.9 The initial alterations of course by the chief officer of the *Bunga Teratai 4* were insufficiently substantial to avoid the collision. The bigger, 20° to starboard alteration of course was too late to prevent the collision.

3.10 The bridge team of the *Bunga Teratai 4* did not work as a cohesive unit. The standard of bridge resource management was poor. The chief officer did not follow the provisions of the Maritime Rules, Part 22 or his own company's operations manual for the keeping of a safe navigation watch.

3.11 The chart work and record keeping by the bridge team of the *Bunga Teratai 4* was less than adequate with particular regard to recording times of position fixes.

3.12 The skipper of the *Mako* used only the Seaplot track plotter for navigation, so there were no records kept of that vessel's track prior to the collision.

3.13 The final alteration of course to starboard by the *Bunga Teratai 4* was too late and in such a close quarter situation that it resulted in the stern of the ship swinging towards the fishing vessel and probably exacerbated the situation rather than relieving it.

3.14 Neither vessel used the sound signal prescribed in Maritime Rules Part 22.34 to warn the other vessel of the possibility of collision.

3.15 The skipper of the *Mako* may have been chronically fatigued.

4 Safety Recommendations

4.1 On 2 March 2004 the Commission recommended to the Chief Executive Officer of McDonald and Brown Limited that he:

4.1.1 in conjunction with his safe ship management company amend his operations manual to include specific instructions on the use of the watch alarm by the skippers of his vessels (001/04).

4.1.2 promote and include in his operations manual information on the causes, effects and strategies to minimise the effects of fatigue on his crews, particularly the skippers (002/04).

4.2 On 24 March 2004, the owner of the *Mako,* in conjunction with his Safe Ship Management Company, replied, in part, that they have added a section to the *Mako's* Safe Ship Management Policy Manual which reads:

> It is the company policy that the skipper is responsible to ensure that the watch keeper alarm is used when the vessel is underway or at any time that a watch is required to be kept.
>
> The skipper is responsible to ensure that when the crew is on duty, that they are fit to carry out that duty. See fitness for duty and Fatigue at end of manual.

The owner further advised that the relevant sections of the Maritime Rules concerning fitness for duty and fatigue have been included as an appendix in the *Mako's* Safe Ship Management Policy Manual and that the crew would be required to sign an acknowledgement that they had read them.

4.3 On 2 March 2004 the Commission recommended to Chief Executive Officer of Malaysia International Shipping Corporation that he:

4.3.1 promote the benefits of bridge resource management throughout the navigating officers in the fleet (003/04).

4.3.2 disseminate this report among the fleet as a way to promote better attention to bridge operations, particularly the collision regulations. The realisation that this collision could easily have led to the death of the 4 crew members of the *Mako* might make it more pertinent (004/04).

4.4 On 1 April 2004, the Senior Manager, Health, Safety, Security and Environment Dept. of the Malaysia International Shipping Corporation replied, in part, that they have taken the following actions to implement recommendations 003/04 and 004/04:

> Navigating Officers serving onboard our fleet are programmed for simulator based Bridge Team Management courses in Singapore Polytechnic or Star Cruises Malaysia. This has been ongoing since 2002. However, the numbers of training berths made available to us are limited. Our Management has made a decision last year to acquire our own simulators and the national maritime academy – Malaysian Maritime Academy – would conduct the courses. This involves financial expenditure of a few million dollars but we are confident that the benefits resultant would be realised onboard all out 160 vessels that we currently own.
>
> We are sharing information with all our vessels on major incidents with a primary objective of avoiding recurrence. We carry out this task by issuing a safety memorandum and dissemination it to them. Safety memorandum forms a part of the Corporation's safety management manual system. A Safety Memorandum issued on 11 March 2004 is attached for you attention.

Approved for publication 18 March 2004

Hon W P Jeffries
Chief Commissioner

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